

## REMARKS

This application pertains to a novel separation module.

Claims 2, 4-11, 13-16 and 18-30 are pending; claims 29 and 30 being added by this amendment. Claims 18-25 and 28 have been withdrawn from consideration as drawn to non-elected subject matter, so that the claims under examination are claims 2, 4-11, 13-16, 26, 27, 29 and 30.

New claim 29 recites that the end plate of claim 27 is a perforated ceramic disc, and new claim 30 recites that the ceramic disc is shrunk fit to the capillaries. Support for both of these limitations can be found at page 10, lines 11-15. Those skilled in the art will understand the language "...said perforated plate shrinking onto the capillaries as a result of its shrinkage, so that a mechanically stable and tight connection forms." at page 10, lines 14-15 to mean that the perforated plate is shrunk-fit to the capillary tubes passing through it. No new matter is added.

Applicants respectfully request that upon the allowance of claims drawn to the elected subject-matter, the non-elected claims be rejoined.

Claims 4,5, 7-9, 26 and 27 stand rejected under 35 U.S.C. 103(a) as obvious over Filippi (US 3,536,611) in view of Borelli (US 6,350,618) and further in view of Garcera (US 4,640,774).

Claim 27 is the main (elected) claim presently under examination.

Applicants' claims pertain to: (claim 27) "A separation module comprising...**sintered porous** ceramic capillaries...an end of each...passing through an

end plate..."

At page 4, line 2 of the Office Action, the Examiner contends that Filippi teaches...porous ceramic capillaries (36). The Examiner, apparently recognizing that Filippi does not in fact disclose anything about **porous** ceramic capillaries, later, at page 9, argues that "porous" is an inherent property in ceramic composites.

It is very clear, however, that Filippi's capillaries are not "porous". Filippi's capillaries are (semi permeable) membranes, and as such are not "porous". Only those substances that are permeable through the membrane may permeate through it, whereas a "porous" capillary is not nearly as selective.

Thus, at column 1, lines 22 and 23, Filippi refers to a "...permeate-rich fraction permeating through the capillary walls."

At column 1, lines 29-30, Filippi describes his invention as "...employing membrane permeation techniques."

At column 1, lines 66-67 Filippi refers to his invention as "...an improved membrane device...".

At column 2, lines 5-7, Filippi refers to "...an encircling permeation membrane, such as a bundle of capillary tubes...".

At column 2, lines 38-39, Filippi refers to "...removal of the permeate-rich fraction from the capillary walls...".

At column 2, lines 56-57, Filippi refers to his invention as a "...compact membrane device operable for the separation by permeation techniques...".

At column 3, lines 3-5, Filippi discloses that "A further object of our invention is to provide an improved membrane device employing capillary tubes as the membrane ...".

Hackh's Chemical Dictionary, Fourth edition, defines "membrane" as "a tissue that permits the passage of certain substances, e.g., water or crystals, but prevents the passage of others, e.g., colloids".

Hackh's defines "porous" as "penetrated by small open spaces".

Clearly, the capillary tubes disclosed by Filippi are membranes, and are not porous within the common understanding of the meaning of that word.

In this regard, the Examiner's attention is respectfully drawn to page 11 of Applicants' specification, where in the paragraph beginning on line 30 Applicants' teach that for use of their separation module for liquid filtration, gas separation or pervaporation, a membrane layer on the porous capillaries is necessary.

Clearly, there is a difference between Applicants' porous capillaries and Filippi's membranes.

One can easily see from the Filippi reference that Filippi et al. are themselves familiar with the difference between porosity and membranes, i.e., "selective permeation".

Filippi et al. teach that on the one hand the distributor shall be “porous”, whereas the capillaries “exhibit selective permeation”. Clearly, Filippi’s capillaries are not “porous”.

Thus, the argumentation of the Examiner that the Filippi reference discloses “porous” ceramic capillaries simply does not hold true.

Furthermore and particularly in response to the argumentation of the Examiner that it “is an inherent property in ceramic composites” to be “porous” (see page 9 of the current office action), Applicants respectfully submit that porosity is by no means an inherent property of ceramics.

The Examiner's attention is respectfully drawn to the following reference (<http://en.wikipedia.org/wiki/Ceramic>) , which provides an overview on what is meant by the term “ceramic”.

In said reference it is made clear that “ceramic” materials “may have a crystalline or partly crystalline structure, or may be amorphous (e.g., a glass)”. Clearly glass does not inherently have “porous” properties; otherwise any window would be opaque.

Turning back to the Filippi reference in Col. 6, lines 3-4, Filippi et al. offer the option of choosing between the equivalents “glass (...) metals (...) ceramics” as a material for the capillaries. Knowing that neither metal nor glass display “inherent porous properties” and keeping in mind that “selective permeation” of a substance is required by the Filippi reference, there is absolutely nothing in the Filippi reference that would (even in view of the average knowledge of one of ordinary skill in the art) teach or suggest the use of “porous” ceramic materials for his capillaries.

Accordingly, it is clear that nothing in the Filippi reference would lead to the use of porous capillaries.

In addition, the Examiner acknowledges that Filippi does not disclose anything about sintering, and turns to the Borelli reference for a teaching of sintering.

Borelli, however, does not teach or suggest anything about sintering a capillary. Borelli is concerned with a "honeycomb preform" (col. 4, line 45) which is sintered "to meld the powder particles" (col. 4, lines 56-57).

This has nothing to do with a sintered capillary tube.

Furthermore, the application of "sintering" to Filippi's "membranes" makes no sense. Those skilled in the art would clearly understand that sintering would change the structure of the membrane, and that this would affect the permeability of the membrane by the selected substances. The selective permeability would be altered, so that the original "selective permeability" would no longer exist.

Those skilled in the art having selected a membrane material to accomplish the desired separation would certainly not "sinter" the membrane, as this would clearly affect the balance between those substances that could and could not permeate the membrane.

No person skilled in the art reading Filippi and Borelli would have any reason to "sinter" Filippi's membranes.

The Borelli reference is concerned with a "device that can be used in sample transfer between multiwell plates of differing well density" (see again Col. 1, Lines 11-

16).

To enable such transfer, the Borelli reference further teaches that the device is constructed in such a way that “a reservoir (is built) which retains liquid by capillary pressure” (see Abstract). Thus, if the teachings of the Borelli process were applied to the Filippi reference, the capillaries produced would not be porous. If they were porous retaining of the liquid would be impossible, as the liquid would leak (see also Col. 5, lines 1-2 of the Borelli reference: “walls of high density and no open porosity”).

Thus in view of both the Borelli and the Filippi references those having ordinary skill in the art would either choose to have unsintered capillaries, as in the Filippi reference, or a surely non-porous material as in the Borelli reference. No reading of this combination of references could ever lead to ceramic membranes that would be both sintered and porous.

The Examiner turns to the Garcera reference which, according to the Examiner, teaches “capillaries (filter members)...joined together by staggered ceramic film strips pressed at least partially around and connecting adjacent capillaries so they don't move... The Examiner specifically refers to col. 6, lines 64-66 and col. 7, lines 13-26.

Applicants have carefully reviewed the language in the Garcera reference mentioned by the Examiner, and do not find anything about “staggered ceramic film strips” mentioned anywhere. Applicants do note a discussion of “projections 16” formed on the capillaries (col. 6, line 60), and that these are formed by depositing a tape of ceramic paste on the end of a member and then baked to sinter it to the surface of the member (col. 6, lines 63-67), but this has nothing to do with “staggered ceramic

film strips". Clarification is respectfully requested.

It is therefore clear that no combination of Filippi/ Borelli/Garcia reference would ever lead to Applicants' separation module.

The rejection of claims 4-5, 7-9 and 26-27 under 35 U.S.C. 103(a) as obvious over Filippi (US 3,536,611) in view of Borelli (US 6,350,618) and further in view of Garcera (US 4,640,774) should therefore be withdrawn.

Claims 2, 6, 12 and 15 stand rejected under 35 U.S.C. 103(a) as obvious over Filippi (US 3,536,611) in view of Borelli (US 6,350,618) and further in view of Garcera (US 4,640,774) as applied to claim 27 above and further in view of Taketomo (US 4,671,809).

The differences between Applicants' claims and anything that can be derived from the Filippi / Borelli / Garcera combination of references have been discussed above.

The Examiner relies on Taketomo for defined distances and an end plate. No defined distances or end plates could possibly overcome the differences pointed out above between the module defined by Applicants' claims and anything that could be derived from the Filippi / Borelli / Garcera combination of references.

The rejection of claims 2, 6, 12 and 15 under 35 U.S.C. 103(a) as obvious over Filippi (US 3,536,611) in view of Borelli (US 6,350,618) and further in view of Garcera (US 4,640,774) as applied to claim 27 above and further in view of Taketomo (US 4,671,809) should therefore now be withdrawn.

Claims 10-11 and 16 stand rejected under 35 U.S.C. 103(a) as obvious over Filippi (US 3,536,611) in view of Borelli (US 6,350,618) and further in view of Garcera (US 4,640,774) as applied to claim 27 above and further in view of Hersey (US 4,990,412).

The differences between Applicants' claims and anything that can be derived from the Filippi / Borelli / Garcera combination of references have been discussed above.

The Examiner relies on Hersey for thin membranes with separation activity on the inside / outside of the sintered ceramic capillaries. No thin membranes with separation activity on the inside / outside of the sintered ceramic capillaries could possibly overcome the differences pointed out above between the module defined by Applicants' claims and anything that could be derived from the Filippi / Borelli / Garcera combination of references.

Furthermore it should be noted that if the Borelli reference is used thin membranes anywhere on the capillaries would be completely useless as the capillaries sintered as in the Borelli reference would not allow for mass transfer (see above)

The rejection of claims 10-11 and 16 under 35 U.S.C. 103(a) as obvious over Filippi (US 3,536,611) in view of Borelli (US 6,350,618) and further in view of Garcera (US 4,640,774) as applied to claim 27 above and further in view of Hersey (US 4,990,412) should therefore now be withdrawn.

Claims 13 and 14 stand rejected under 35 U.S.C. 103(a) as obvious over Filippi (US 3,536,611) in view of Borelli (US 6,350,618) and further in view of Garcera (US



4,640,774) as applied to claim 27 above and further in view of Shay (US 4,310,607).

The differences between Applicants' claims and anything that can be derived from the Filippi / Borelli / Garcera combination of references have been discussed above.

The Examiner relies on Shay for a housing of stainless steel. No stainless steel housing could possibly overcome the differences pointed out above between the module defined by Applicants' claims and anything that could be derived from the Filippi / Borelli / Garcera combination of references.

The rejection of claims 13 and 14 under 35 U.S.C. 103(a) as obvious over Filippi (US 3,536,611) in view of Borelli (US 6,350,618) and further in view of Garcera (US 4,640,774) as applied to claim 27 above and further in view of Shay (US 4,310,607) should therefore now be withdrawn.

In view of the present amendments and remarks it is believed that claims 2, 4-11, 13-16 and 18-28 are now in condition for allowance. Reconsideration of said claims by the Examiner is respectfully requested and the allowance thereof is courteously solicited.

CONDITIONAL PETITION FOR EXTENSION OF TIME

If any extension of time for this amendment is required, applicants request that this be considered a petition therefore. Please charge the required petition fee to Deposit Account No. 14-1263.

ADDITIONAL FEE

Please charge any insufficiency of fee or credit any excess to Deposit Account No. 14-1263.

Respectfully submitted,  
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